Lat 40.20614 Lon -121.18707

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Subject: Black stain root disease in the Prattville Forest Restoration Area, Almanor RD (FPM Evaluation # NE00-09)

To: District Ranger, Almanor RD

On February 9, at the request of Russ Volke, district silviculturist, I examined conifer mortality in the Prattville Forest Restoration project area to determine if the cause of death was black stain root disease caused by the fungus *Leptographium wageneri*, and to provide management options for the area. Tom Simonson, forest silviculturist and Robin Bryant, district sale prep forester accompanied Russ and me. On February 24, Russ, Robin and I returned with John Kliejunas, regional plant pathologist, and Ron Perry, district forest technician. One to two feet of snow was present on the first visit and an additional eighteen inches of fresh snow was present on the second visit. Black stain root disease was confirmed in the pine and in one 10" dbh Douglas fir by observing characteristic black-staining in the outer growth rings of the conifers and microscopically in the lab, by observing dark hyphae, characteristic of *L.. wageneri*, growing in the trachieds of black-stained wood samples.

The project area is a 100 acre section of a 1200 acre ponderosa pine plantation that was planted in several stages over forty years ago. The plantation is located mostly in S ½ Sec 10 and N ½ Sec 15 T27N R7E, Mt Diablo Meridian. The plantation was planted on an area that burned early in the century and regrew into a brush field understocked with conifers. Before planting, the area was site prepped by uprooting and windrowing most of the vegetation except for some mature conifers. The plantation was precommercially thinned once and part of the plantation was commercially harvested in 1993. Prior to harvest, black stain root disease was identified in ponderosa pine on the ridge located on the southern edge of the plantation. In addition to ponderosa pine, the ridge top and the south facing slope of the ridge (outside of the plantation) is growing Douglas fir, white fir, sugar pine and incense cedar. In 1993, the black stain root disease mortality on the ridge was clearly visible on aerial photos. Pine trees killed by or suspected of having black stain root disease were removed during harvest operations.

Since 1993, approximately 12 new black stain root disease centers developed on the ridge in ponderosa pine and at least one 10" dbh Douglas fir. The disease was confirmed by observing black-staining in the outer growth rings of recently killed ponderosa pine and one dying 10" dbh Douglas fir. Thin sections of black-stained wood were examined microscopically in the lab and dark hyphae, characteristic of *L. wageneri,* were seen growing inside the trachieds of both the pine and Douglas fir.

Most of the root disease centers that were thinned and cleared of diseased pine in 1993 appear healthy today. A few infected or killed pine are present on the margins of the treated disease centers. In general, the black stain root disease was successfully treated in 1993 because the

residual pine trees (approximately 12" to 18" dbh) are separated by incense cedar, white fir, sugar pine and Douglas fir. Sugar pine is a weak host and the other conifers are not hosts for the ponderosa pine race of *L. wageneri*. By keeping the ponderosa pine separated by other conifers, local spread of the black stain root disease through root contacts has been curtailed within the old centers. However, new black stain root disease centers became established on the ridge since 1993. New black stain centers occur when root-feeding beetles carry the fungal spores from infected roots to uninfected roots of host trees outside of established centers.

One of the management objectives of the Prattville forest restoration project is to minimize the spread of black stain root disease (BSRD) throughout the remainder of the plantation, which is primarily ponderosa pine. To achieve this objective, it is necessary to consider that:

- BSRD is caused by three different host-specific races of *L. wageneri* (DF, PP/JP and pinyon pine)
- BSRD is endemic to California's forests
- Local, short distance spread of BSRD occurs through host-to-host root contacts
- Long distance spread of BSRD occurs when root feeding beetles (the vector) carry spores from infected to uninfected roots (effective spread distance is not known)
- The known BSRD vector is most active in the spring and early summer
- The BSRD vectors are most likely to successfully feed on slow growing, stressed hosts
- BSRD can survive only in a living host tree

Another management objective of the project is to retain as many trees as possible in order to maximize the return on the investment cost of establishing and thinning the plantation.

Considering the factors relevant to BSRD and the management objectives, a good way to minimize the spread of BSRD in the Prattville forest restoration project is to reduce the stocking as much as possible. This will increase host vigor and reduce the effectiveness of the vector (minimize, though not eliminate, long distance spread of BSRD). By reducing the stocking to a point where host-to-host root contact is minimized, short distance spread of BSRD will be limited when new infections occur through long distance spread. To limit the spread within and adjacent to established BSRD centers, all suspected BSRD infected host trees should be removed. All harvest activity should occur in the late summer, fall and winter. Unacceptable openings should be planted with non-host trees.

I hope this discussion provides the information you need to complete the Prattville forest restoration project. Please contact me at 252-6680 (voicemail) or wwoodruf/r5,lassen (IBM) if you have any questions or requests.

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